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24. A meat processing apparatus comprising:

a decompression chamber defining an interior volume, wherein said decompression chamber is configured to permit a meat product of substantial size to be placed within and removed from said interior volume;

a gas output in communication with said interior volume of said decompression chamber, and

a high speed decompression valve arranged along said compressed gas output and configured to

enable creation of a pressure differential across said decompression valve with a relatively positive pressure within said interior volume of said decompression chamber, and

enable decompression of said decompression chamber on the order of at least about 10 MPa/sec through transfer of gas from said interior volume of said decompression chamber through said decompression valve.

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25. A meat processing apparatus as claimed in claim 24 wherein said decompression valve comprises a rupture disc configured to burst under a predetermined pressure differential.

26. A meat processing apparatus as claimed in claim 24 wherein said decompression valve comprises a reciprocating high-speed valve.

27. A meat processing apparatus as claimed in claim 24 further comprising a source of oxygenating gas in communication with said interior volume of said decompression chamber.

28. A meat processing apparatus as claimed in claim 27 wherein said source of oxygenating gas has a composition selected to enhance a red color of said meat product.

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29. A meat processing apparatus as claimed in claim 28 wherein an amount of oxygen present in said oxygenating gas exceeds the amount of oxygen present in air.

30. A meat processing apparatus as claimed in claim 29 wherein said oxygenating gas consists essentially of substantially pure oxygen.

31. A meat processing apparatus as claimed in claim 24 wherein said decompression chamber is constructed of a material that allows cleaning and sterilizing in accordance with meat packing industry sanitary practices.

32. A meat processing apparatus as claimed in claim 24 further comprising a controller programmed to monitor and control the pressurization and decompression of the decompression chamber.

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33. A meat processing apparatus as claimed in claim 24 further comprising a noise damping or absorbing structure configured to reduce noise generated by gas released under rapid decompression.

34. A method of processing meat by:

positioning a meat product within an interior volume of a decompression chamber;

creating a pressure differential across a gas output in communication with said interior volume of said decompression chamber; and

rapidly decompressing said decompression chamber at a decompression rate of at least about 10 MPa/sec by transferring gas from said interior volume of said decompression chamber through said gas output.

35. A method of processing meat as claimed in claim 34 wherein said pressure differential and said rate of rapid decompression are selected to be suitable for tenderizing said meat product.

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36. A method of processing meat as claimed in claim 34 wherein said pressure differential and said rate of rapid decompression are selected to be suitable for killing microorganisms in said meat product.

37. A method of processing meat as claimed in claim 34 wherein said decompression chamber is rapidly decompressed upon bursting of a rupture disc configured to burst under a predetermined pressure differential.

38. A method of processing meat as claimed in claim 34 wherein said decompression chamber is rapidly decompressed upon activation of a reciprocating high-speed valve.

39. A method of processing meat as claimed in claim 34 wherein said rate of rapid decompression is between about 10 MPa/sec and about 350 MPa/sec.

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40. A method of processing meat as claimed in claim 34 wherein said pressure differential is created by introducing compressed gas into said interior volume of said decompression chamber.

41. A method of processing meat as claimed in claim 34 wherein said pressure differential is created by maintaining said interior volume of said decompression chamber near atmospheric pressure and placing said gas output in communication with a vacuum chamber below atmospheric pressure.

42. A method of processing meat as claimed in claim 34 wherein said decompression chamber is rapidly decompressed by elevating said pressure differential beyond a bursting limit of a rupture disc extending across said gas output.

43. A method of processing meat as claimed in claim 34 wherein said decompression chamber is rapidly decompressed by actuating a valve extending across said gas output.

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44. A method of processing meat as claimed in claim 34 wherein said pressure differential is created by filling said interior volume of said decompression chamber with an oxygenating gas having a composition selected to enhance a red color of said meat product.

45. A method of processing meat as claimed in claim 44 wherein the amount of oxygen present in said oxygenating gas significantly exceeds the amount of oxygen present in air.

46. A method of processing meat as claimed in claim 45 wherein said oxygenating gas consists essentially of substantially pure oxygen.

47. A method of processing meat by:

positioning a meat product within an interior volume of a decompression chamber;

creating a pressure differential across a gas output in communication with said interior volume of said decompression chamber, wherein said pressure differential is created by filling said interior volume with a gas that comprises oxygen; and

rapidly decompressing said decompression chamber at a rapid decompression rate by transferring gas from said interior volume of said decompression chamber through said gas output.

48. A method of processing meat as claimed in claim 47 wherein the amount of said gas is selected to enhance a red color of said meat product.

49. A method of processing meat as claimed in claim 47 wherein the amount of oxygen in said gas significantly exceeds the amount of oxygen present in air.

50. A method of processing meat as claimed in claim 47 wherein said gas consists of essentially pure oxygen.

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51. A method of processing meat as claimed in claim 47 wherein said gas further comprises a spoilage inhibiting gas.
52. A method of processing meat as claimed in claim 50 wherein said spoilage inhibiting gas comprises carbon dioxide.
53. A method of processing meat as claimed in claim 47 wherein said pressure differential and said rapid decompression rate are selected to be suitable for tenderizing said meat product.
54. A method of processing meat as claimed in claim 50 wherein said pressure differential and said rapid decompression rate are selected to be suitable for killing microorganisms in said meat product.
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55. A method of processing meat as claimed in claim 47 wherein said rapid decompression rate is at least about 10MPa/sec.
56. A method of processing meat as claimed in claim 47 wherein said rapid decompression rate is between about 10 MPa/sec and about 350 MPa/sec.
57. A method of processing meat as claimed in claim 47 wherein said decompression chamber is rapidly decompressed upon bursting of a rupture disc configured to burst under a predetermined pressure differential.
58. A method of processing meat as claimed in claim 47 wherein said decompression chamber is rapidly decompressed upon activation of a reciprocating high-speed valve.
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